The Antimicrobial Activity of *Hippophae rhamnoides*

Demet Celebi[1,2*] , Ozgur Celebi[3], Sumeyye Baser[3]

[1]Ataturk University, Faculty of Veterinary Medicine, Department of Microbiology, 25240 Erzurum, Turkey; D.C.; celebiidil@atauni.edu.tr

[2]Ataturk University, Ataturk University Vaccine Application and Development Center, 25240 Erzurum, Turkey; D.C.; celebiidil@atauni.edu.tr

[3]Ataturk University, Faculty of Medicine, Department of Medical Microbiology, 25240, Erzurum, Turkey; O.C.; ozgur.celebi@atauni.edu.tr, S.B.; sumeyyebaser06@gmail.com

Corresponding author: Demet Celebi, Ataturk University, Faculty of Veterinary Medicine, Department of Microbiology, 25240 Erzurum, Turkey

mail: celebiidil@atauni.edu.tr;

Received: January 14, 2023 **Accepted:** February 22, 2023 **Published:** April 30, 2023

To cite this article: Celebi D, Celebi O, Baser S. (2023). The Antimicrobial Activity of Hippophae rhamnoides. *Recent Trends in Pharmacology,* vol 1, issue 1:11-15.

Abstract

Hippophae rhamnoides is a spiny decidous shrub. The plant has sour sweet little fruits ranging from yellow to red. For this purpose we started to investigate whether the plants used in traditional medicine in Erzurum and its vicinity have antibiotic effects. Among them we investigated the fruits of Hippophae Rhamnoides, which is called as ‘’yalancı iğde’’ locally and grown in abundance in the Oltu-Tortum districts of Erzurum, Turkey. In the study, it was aimed to determine the antimicrobial activities of aqueous extraction of fruits. For the purpose, *Escherchia coli, Pseudomonas aureginosa, Staphylococcus aureus* and *Candida albicans* microorganisms were used as reference and the antimicrobial activities of fruit compared with gentamiycin (10ug) using disc diffusion method, As a negative control, DMSO used. According in the findings gentamiycin diameter of 20 mm was found an all samples,while *Escherchia coli* 11 mm, *Pseudomonas aureginosa* 10 mm, *Staphylococcus aureus* 15 mm zone diameters were observed in the aqueous extraction of fruit and there was no effect for *Candida albicans.*

As a result, it is thought that it may be an alternative to skin infections because it has a higher antimicrobial effect on *Staphylococcus aureus* which fraquently causes skin infectious.

Keywords: *H. rhamnoides,* Antimicrobial Activity, Disc Diffusion Method,

Introduction

Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus among the nosocomial infections, are important clinical pathogens. Multi-antibiotic resistance, which is responsible for multi-antibiotic-resistant infections, and it is important with its high mortality rate in infections (Arısoy, 2011). While the rate of penicillin resistance was only 1% in *Staphylococcus aureus* strains, this rate increased after 5 years. It has reached 38%, decreased sensitivity to vancomycin has begun to be mentioned (Bastürk, 2005). *Pseudomonas aeruginosa* is the most common nosocomial infection among Gram-negative bacilli is bacteria. The importance of *Pseudomonas aeruginosa* infections is itself a risk associated with death is the factor. *Escherichia coli* is mostly responsible for community-acquired urinary tract infections. However, can also be the causative agent of nosocomial infection in hospitalized patients with severe underlying disease (Bexfield et al., 2014) Chawla 2007; Kaushal,2011; Conner,1993). The pathogenicity and high invasiveness of *C. albicans*, which is one of the most well-known species, arise from a wide range of virulence factors, such as yeast-to-hyphal transformation, strong adherence to cell/tissues and easy survival in varied anatomical sites. These together allow Candida spp. to efficient evasion of host immune mechanisms (Sadowska et al.,2017).

The resistance of bacteria with multi-antibiotic resistance is clinical is increasing rapidly in the environment and society. A large number of newly developed antibiotics. Most of them are modifications of existing synthetic drugs and bacteria are rapidly becoming resistant necessitates the search for new solutions. For this purpose, superbacteria showed various herbal and animal extracts that may be effective against resistance are being investigated of these some of them are quite promising (Salem et al.,2010).

All parts of Hippophae rhamnoides, carotenoids, tocopherols, sterols, flavonoids, lipids, vitamins, tannins, minerals, etc. of a large number of bioactive compounds, including recognized as a source. Contributes to its extensive use as a natural antioxidant are available. Phenol and flavonoid content, in fruits and shells of *Hippophae rhamnoides* is rich. Phenolic compounds such as flavonoids, phenolic acid and tannin found in hippophae leaves, It is an important phytochemical group with strong antioxidant and antibacterial activity. Due to the versatile composition and low toxicity of plant essential oils and extracts, Their broad antimicrobial spectrum makes them useful in food preservation made them potential natural agents. *Hippophae rhamnoides* seed extract. *Bacillus cereus, Bacillus coagulans, Bacillus subtilis, Listeria monocytogenes* and *Yersinia enterocolitica* also has antimicrobial activity against *Hippophae rhamnoides* fruit and antibacterial activity of leaves against methicillin-resistant *Staphylococcus aureus* it has been found that it shows.

Materials and Methods

Hippophae rhamnoides Extraction

Pure extraction

Firstly, the processed and untreated leaves are one by one with a special grinding machine powdered. Then, the weight of the sample is weighed on a precision scale by taking the tare determined. Ground leaf powders of which weight is determined are placed in the vessel unit of the device given to the device.

Disc Diffusion Method

Hippophae rhamnoides leaf extracts were performed with the standard strains of "Microbiologics (France)" *S. aureus* ATCC 25923, *P. aeruginosa* ATCC 9027, *E. coli* ATCC 25922 and Candida albicans 10231. In antimicrobial susceptibility tests, Thermo Scientific™ Oxoid™ (USA) brand blank discs and Thermo Scientific™ Oxoid™ brand (USA) gentamicin disc were used as positive and negative controls. *Hippophae rhamnoides* leaf samples were obtained from Oltu-Tortum-Erzurum region, which is among the regions where this plant is concentrated in our country.

For disc diffusion, single dropped bacteria on 18-24 hour blood agar medium. The colonies were suspended in sterile saline. Turbidity of suspension it set to 0.5 McFarland. Three loops were taken from the bacterial suspension with a sterile standard loop. Mueller Hinton agar was rubbed onto the surface of the medium. This process is done separately for each bacterium carried out. Before applying the discs, the media should be rinsed for 5 minutes to remove excess moisture kept at room temperature. Discs impregnated with plant extracts, in full contact with the agar surface with a sterile forceps, with a gap of at least 24 mm between them placed and incubated at 37°C 24 hours.

Results

According in the findings gentamiycin diameter of 20 mm was found an all samples, while *Escherchia coli* 11 mm, *Pseudomonas aureginosa* 10 mm, *Staphylococcus aureus* 15 mm zone diameters were observed in the aqueous extraction of fruit and there was no effect for *Candida albicans* (Table 1).

Table 1. Zone Diameter

Standard Bacterial Strain/Antimicrobial Agents	Zone Diameter(mm)
S. aureus ATCC 25923	15
P. aeruginosa ATCC 9027	10
E. coli ATCC 25922	11
Candida albicans 10231	None
Gentamycin	20

Discussion

Phenolic compounds such as flavonoids, phenolic acid and tannin found in hippophae leaves, It is an important phytochemical group with strong antioxidant and antibacterial activity. When examined, the leaves of Sea buckthorn dried in the shade or in the sun are mostly juicy, It is seen that ethanolic and methanolic extracts are used.

Antioxidant capacity in aqueous and methanolic extracts of processed sea buckthorn leaves and phenolic profile found in processed leaves in their study that the amount of substance is higher and the antioxidant capacity is higher than the untreated leaves shows that it is higher than.

S. aureus ATCC 25923, *E. coli* ATCC, *P. aeruginosa* ATCC 9027 and *Candida albicans* 10231 which we included in our study. The susceptibility of bacteria to H. rhamnoides was determined by disk diffusion method. It method Gupta et al. (2011) H. salicifolia D. Frost leaves of *Bacillus subtilis, Bacillus thuringirnsis, Pseudomonas fluorescens, Escherichia coli, Agrobacterium tumefaciens* and *Acinetobactor junii* were used to determine the effect.

Similarly Qadir et al. (2016), H. rhamnoides L. effectiveness of disk diffusion on MRSA strains detected by the method. Similarly, we used the disk diffusion method in our research. We used determine whether clinically pathogenic bacteria are susceptible to H. rhamnoides. It is not possible to determine precisely because there are no standards disc diffusion. The diameters of the growth zones obtained as a result of the method were used for susceptibility and resistance. Since the standard zone diameters are not known, the data obtained can only be used for further studies. It will give you a preliminary idea of where to go.

As a result of our research, our bacteria After measuring the zone diameters we see around it, Gupta et al. (2011) In the study, the specified zone diameters were taken as criteria. Although these zone diameters are standard. Although not mentioned in the guides, our results are included in a published article. It helped us think about it. These researchers planted bacteria determined the effect of H. salicifolia in the petri dishes with the zone diameters formed less than 7 mm In the inhibition zone, the bacteria are resistant, in the inhibition zone between 7 and 9 mm. Moderately susceptible to bacteria and susceptible to bacteria in an inhibition zone greater than 10 mm have stated that.

According in the findings gentamiycin diameter of 20 mm was found an all samples,while *Escherchia coli* 11 mm, *Pseudomonas aureginosa* 10 mm, *Staphylococcus aureus* 15 mm zone diameters were observed in the aqueous extraction of fruit and there was no effect for *Candida albicans*

Antibiotics today, against resistant bacteria, natural resources such as plant extracts are a source of hope is seen. Experimental animals based on the data obtained as a result of the study. Further in vivo studies are needed

Conflict of Interest: The author(s) have declared no conflict of interest.

Financial Disclosure: The author(s) did not receive any financial support for this study.

References

1- Arısoy, E.S. 2011. Gram negatif hastane enfeksiyonlarının sağaltımı, Journal of pediatric infection, vol. 5, #1, 152-156.

2- Baştürk, S. 2005. Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa ve Acinetobacter baumannii suşlarında çeşitli kinolon grubu antibiyotiklerin duyarlılıklarının araştırılması, Uzmanlık tezi, T.C. sağlık bakanlığı haseki eğitim ve araştırma hastanesi enfeksiyon hastalıkları ve klinik mikrobiyoloji kliniği.

3- Bexfield, A., Nigam, Y., Thomas, S., Ratcliffe, N.A. 2004. Detection and partial characterisation of two antibacterial factors from the excretions/secretions of the medicinal maggot Lucilia sericata and their activity against methicillin-resistant Staphylococcus aureus (MRSA), Microbes Infect, vol.,16 #4, 1297-304.

4- Chawla, R., Arora, R., Singh, S., Sagar, R. K., Sharma, R. K., Kumar, R. et al. 2007, Radioprotective and antioxidant activity of fractionated extracts of berries of Hippophae rhamnoides, Journal of Medicinal Food, vol., #10, 101–9.

5- Conner, D.E. 1993. Naturally occurring compounds, antimicrobials in foods, In: Davidson, P.M., Branen, A.L. (ed.)., Marcel Dekker, New York, 441-68.

6- Kaushal, M., Sharma, P.C., 2011. Nutritional and antimicrobial property of sea buckthorn (Hippophae sp.) seed oil, J Sci Indust Res, vol., #70, 1033-6.

7- Sadowska, B., Budzyńska, A., Stochmal, A., Żuchowski, J., & Różalska, B. 2017. Novel properties of Hippophae rhamnoides L. twig and leaf extracts-anti-virulence action and synergy with antifungals studied in vitro on Candida spp. model. Microbial pathogenesis,vol., # 107, 372-9.

8- Saleem, M., Nazir, M., Ali, M.S., Hussain, H., Lee, Y.S., Riaz, N., Jabbar, A., 2010. Antimicrobial natural products: An update on future antibiotic drug candidates, Natural product reports, vol., #27, 2, 238-54.

9- Aras, A., Ceylan, F.D., Yanar, O., Boztas, K., Capanoglu, E., 2016. Investigating the antioxidant properties and rutin content of sea buckthorn (Hippophae rhamnoides L.) leaves and branches, African Journal of Biotechnology, vol., #15, 5, 118-24.

10- Gupta, S.M., Gupta, A.K., Ahmed, Z, Kumar, A. 2011. Antibacterial and Antifungal Activity in Leaf, Seed Extract and Seed Oil of Seabuckthorn (Hippophae salicifolia D. Don) Plant. J Plant Pathol Microbiol vol., #2:105.

11- Qadir, M. I., Abbas, K., Younus, A., & Shaikh, R. S. 2016. Antibacterial activity of sea buckthorn (Hippophae rhamnoides L.) against methicillin resistant Staphylococcus aureus (MRSA). Pak J Pharm Sci, vol., #29,5, 1705-7.